Pyrazinoisoquinolinones (**2**) can be synthesized by different methods, for instance starting from the easily available N-[1.2.3.4-tetrahydroisoquinolyl-1-methyl] carboxamides (**1**)[9,10]. Acylation of **1** with chloroacetylchloride is followed by ring closure in the presence of strong bases. Praziquantel ($C_{19}H_{24}N_2O_2$, Mol.wt 312,42) is a colourless, almost odourless crystalline compound having a bitter taste. It is stable under normal conditions and melts at 136–139 °C (decomposition). It is soluble in most organic solvents (9.7 g/100 ml ethanol; 56.7 g/100 ml chloroform at 25 °C) and only sparingly soluble in water (0.04 g/100 ml at 25 °C). Its structure is in full agreement with the IR, NMR, mass spectra and elemental analysis. Praziquantel has excellent activity against all species of Schistosomes pathogenic to man[12–14]. In addition it proves highly effective in a single oral dose against all intestinal cestode species in man and a great variety of cestode species in animals, including Echinococcus[15,16]. Preliminary experiments indicate that it is also effective against various larval stages of cestodes[15]. Praziquantel was well tolerated in acute and subacute toxicity tests in various animals. No teratogenic or mutagenic activity has been observed[17,18]. Clinical testing is now under way around the world fully to evaluate the field efficacy of Praziquantel[16,19–23].

1 P. J. Islip, in: Progress in Drug Research, vol. 17, p. 241. Birkhäuser Verlag, Basel and Stuttgart 1973. – R. B. Burrows, in: Progress in Drug Research, vol. 17, p. 108. Birkhäuser Verlag, Basel and Stuttgart 1973.
2 T. H. Pesigan, World med. J. *14*, 18 (1967).
3 H. W. Brown, Clin. Pharmac. Ther. *10*, 5 (1969).
4 R. Goennert, Münch. med. Wschr. *116*, 1531 (1974).
5 Jointly developed by E. Merck (Darmstadt) and Bayer AG.
6 Internal designation is EMBAY 8440.
7 J. Seubert, H. Thomas and P. Andrews, German Offenlegungsschrift P 23 62 539.
8 R. Pohlke, German Offenlegungsschriften P 17 95 728, P 25 08 947. – R. Pohlke, F. Loebich, J. Seubert, H. Thomas and P. Andrews, German Offenlegungsschrift P 23 31 713. – J. Seubert, R. Pohlke, H. Thomas and P. Andrews, German Offenlegungsschrift P 24 41 261. – J. Seubert, German Offenlegungsschriften P 24 18 111, P 24 57 971.
9 H. Rupe and W. Frey, Helv. Chim. Acta *22*, 673 (1939).
10 J. Seubert, German Offenlegungsschrift P 25 04 250.
11 Detailed papers on syntheses and structure-activity relationships of **2** will be published elsewhere.
12 P. Andrews, R. Goennert, R. Pohlke and J. Seubert, Abstracts of the Tagung deutschsprachiger tropenmedizinischer Gesellschaften in Lindau, Lake Constance, March 24–26, 1977.
13 A. Davis, Abstracts of the Tagung deutschsprachiger tropenmedizinischer Gesellschaften in Lindau, Lake Constance, March 24–26, 1977.
14 G. Webbe and C. James, Abstracts of the Tagung deutschsprachiger tropenmedizinischer Gesellschaften in Lindau, Lake Constance, March 24–26, 1977.
15 H. Thomas, R. Goennert, R. Pohlke and J. Seubert, Abstracts of the 7th International Conference on Pathophysiology of Parasitic Infections in Thessaloniki, Greece, July 14–16, 1975.
16 M. A. Gemell, P. D. Johnstone and G. Oudemans, Res. vet. Sci. (in press).
17 H. Diekmann, P. Andrews, M. v. Eberstein, H. Frohberg, P. Groning and P. Muermann, a) abstracts of the 7th International Conference on Pathophysiology of Parasitic Infections in Thessaloniki/Greece, July 14–16, 1975 and b) Abstracts of the 2nd European Multicolloquy of Parasitology Trogir, Jugoslavia, September 1975.
18 P. Muermann, M. v. Eberstein and H. Frohberg, Vet. med. Nachr. *1976*, 142.
19 D. Bankov, Abstracts of the 7th International Conference on Pathophysiology of Parasitic Infections, Thessaloniki, Greece, July 14–16, 1975.
20 A. Dey-Hazra, Vet. med. Nachr. *1976*, 134.
21 N. Gueralp, Y. Tigin, T. Oguz, R. Tinar and A. Burgu, Vet. Med. Nachr. *1976*, 129.
22 M. Rommel, H. Grelck and F. Hoerchner, Berl. Münch. Tierärztl. Wschr. *89*, 255 (1976).
23 T. Wikerhauser, J. Beglez, V. Kuticic and B. Kozelj, Acta parasit. jugosl. *7*, 33 (1976).

The biting edges of the chelae and pereiopods of Austropotamobius pallipes[1]

W. J. Thomas

Department of Biological Sciences, University of London, Goldsmiths' College, New Cross, London S.E. 14 6NW (England), 20 January 1977

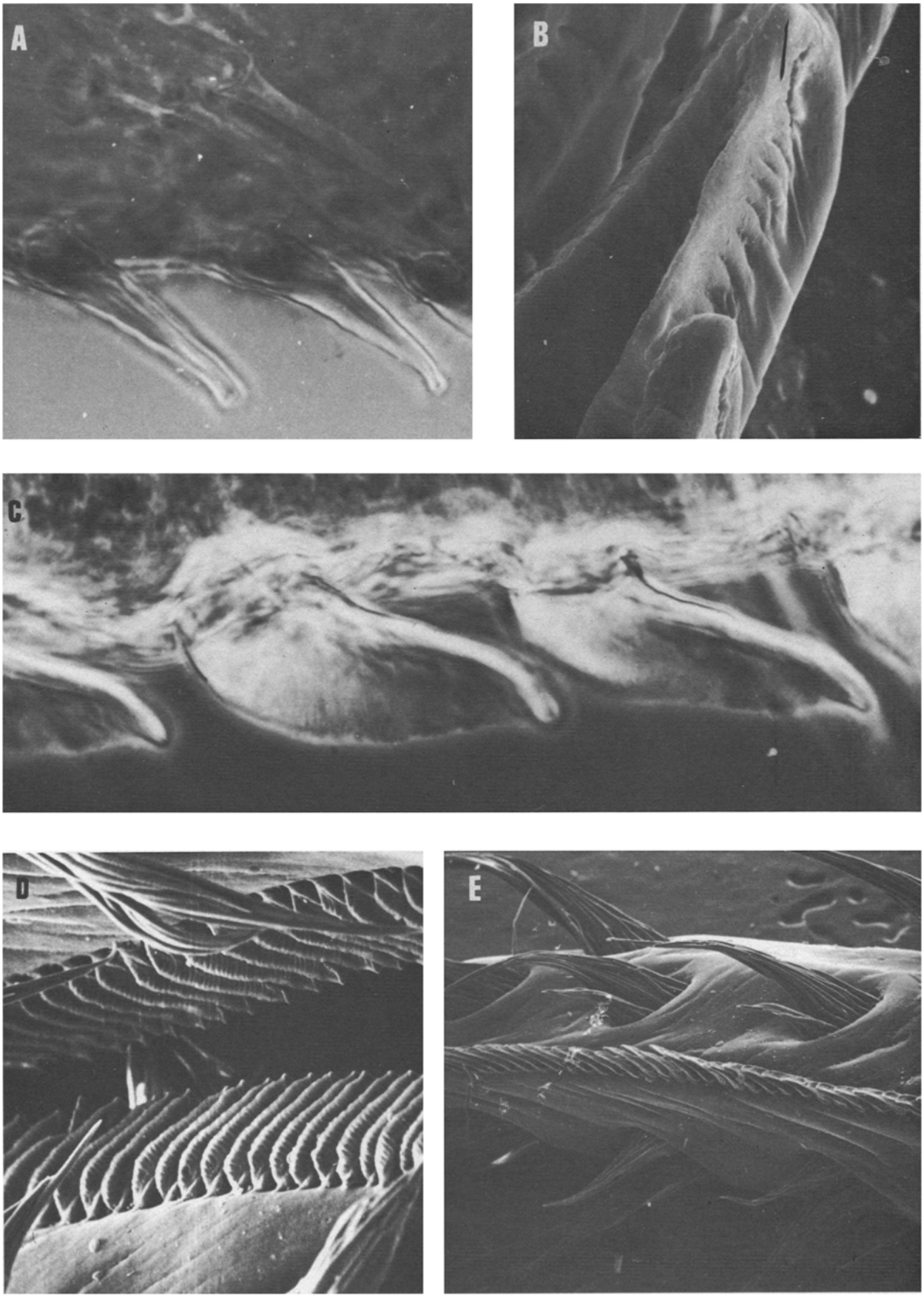
Summary. The 'biting edges' of the chelae and pereiopods of A. pallipes are made up of individual setae of a specialized structure. Those making up the edges of the chelate appendages are modified for prehension, those of the non-chelate appendages, for preening.

At the first hatchling stage of A. pallipes the biting edges of the chelae, first 2 pairs of pereiopods, and the dactyls of the third and fourth pair of pereiopods bear single rows of setal buds. These setal buds are simple outgrowths of the integument (figure, A) which after the first moult become fully developed setae (figure, B). In these early stages these setae are spaced well apart (figure A, and C). During the subsequent growth of A. pallipes, these setae not only dramatically change their form, but increase spectacularly in number and distribution (figure, C, compared to figure D, and E) to form the so called 'biting' edges of the chelae and pereiopods.

Even at the first hatchling stage it can be seen that the setae forming the 'biting' edges are different from other setae in that one side of the setal wall is thickened (figure, A and C). The thickened side of the setae becomes the functional surface as the hatchlings become independent of the mother and abandon their lecithotrophic mode of feeding. The increase in number of setae, together with the exaggerated development of their walls, bring them very close together creating the 'biting' edges in the adult animals (figure, D and E). It is worth noting that the constituent setae on the 'biting' edges of the chelae and chelate pereiopods differ in form and arrangement to those of pereiopods 3 and 4 (figure D, and E).

During feeding in A. pallipes all small prey, e.g. Tubifex, algae, and pieces of detritus are passed to the mouth by the first pair, aided sometimes by the second pair of chelate pereiopods. In addition they are used to clean the dorsal and ventral surfaces of the cephalathorax. The

1 Acknowledgments. To the Central Research Committee of the University of London who provided the financial assistance for this research work.



A Setal buds or precursors from the dactyl of pereiopod 3 of a 1st stage hatchling. × 500. *B* 'Adult' setae, forming part of the biting edge of the dactyl of pereiopod 3. × 500. *C* Individual setae from the dactyl edge of pereiopod 3 of a 6-week-old crayfish. × 435. *D* The biting edges of a chelate pereiopod from an adult crayfish. × 142. *E* The biting edge present on the dactyl of pereiopod 3 of an adult crayfish. × 48.

'tooth' setae making up the biting edges of these appendages are specialized for their function of prehension. Their edges being very thick and relatively flat, with the surfaces sufficiently crenulated to provide a gripping surface. The orientation of the setae, obliquely from their sockets, provides a good clamping surface within the claw of the appendage (figure, D). So here we have adaptions, of shape, surface, the position involved with the prehensile function.

In the very young crayfish these types of tooth setae are present on the edges of the dactyls and propodites of the chelae. 6-week-old specimens have a complete row of from 16–20 tooth setae on the dactyl edge, and a row of 10–12 on the propodite. These setae are still present on the chelae during the first year, but after 1 year they become less prominent, until in large adults they are replaced totally, by rounded cuticular spines. This is but 1 example of setal replacement seen in A. pallipes.

Between copulation and egg-laying, the females of A. pallipes indulge in prolonged periods of preening[2] of the abdominal surfaces and its appendages. This preening is carried out in the main by the third and fourth pereiopods. The main activities are directed to the setae[3] of the pleopods, particularly the future egg bearing setae-oosetae. These setal bundles are combed, and scraped by the tooth setae of the dactyl edges in preparation for their egg bearing role. Just prior to spawning these preening activities become more intense.

A look at the individual tooth setae of these dactyls shows their structure and position to be consistent with their functions of rasping, scraping and combing (figure, B and C). Their edges are relatively sharp, the individual setae emerging more or less vertically from their sockets, and the surfaces of these setae are raised in rasp-like fashion. The end result is a close combing edge, composed of rasping teeth. It is the drawing of these edges over and through the bundles of setae, which clear them of detritus and enables egg attachment to take place.

2 R. Ingle and W. J. Thomas, J. Zool. Lond. *173* (1974).
3 J. C. Mason, Crustaceana *19*, Part 1 (1970).

Importance of G_2 for the cytokinesis of plant cells: Specific blocking by deoxyguanosine

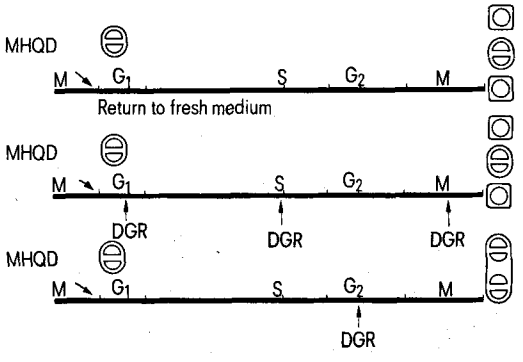
M.-J. Lasselain, C. Pareyre and G. Deysson

Laboratoire de Biologie Cellulaire, UER des Mécanismes d'Action des Médicaments et des Toxiques, Faculté des Sciences pharmaceutiques et biologiques, 4, avenue de l'Observatoire, F-75270 Paris Cédex 06 (France), 13 January 1977

Summary. The modalities of the deoxyguanosine blocking effect on meristematic root cells of Allium sativum L. reveals that, during G_2 phase, fundamental processes leading to cytokinesis take place.

In the course of a previous study, deoxyguanosine (DGR) proved to be a potent inhibitor of Allium sativum L. meristematic root cells cytokinesis[1]. At a 2×10^{-6} M/ml concentration, it causes the formation of binucleate cells after a 6-h-treatment. Such a time lag entitles us to assume that the effect of DGR preceded cytokinesis. We have therefore tried to determine the kinetics of those binucleate cells[2], and in so doing we have brought to light the importance of G_2 phase in the foregoing of cytokinesis.

Through a newly developed technique[2], we are able to use DGR during the all-length of each specific phase of the mitotic cycle: a) First we treat for 1 h with methyl 3, hydroxy 6 quinazoline dione 2–4 (MHQD) (2.5×10^{-7} M/ml). We immediately obtain about 20% of binucleate cells, obviously at the beginning of G_1, knowing that MHQD in no way alters the duration of mitotic cycle[3,4]. b) Then we can treat with DGR that cell population sample as it goes through G_1 (4 h), S (11 h), G_2 (5 h) or M (3 h), with a view to finding out tetranucleate cells.



Evolution of an MHQD binucleate cell after return on a fresh medium and treatment by DGR during different phases.

When DGR acts during G_1, S or M, cytokinesis is never inhibited. Therefore 1 initial binucleate cell, after a double mitosis, gives birth to 1 binucleate cell plus 2 mononucleate cells. Only when DGR acts during G_2 can we observe the appearance of tetranucleate cells (or trinucleate cells, when the 2 central nuclei merge). We must point out that DGR is a strong mitodepressor; so that we never find as many double mitosis as initial binucleate cells. For example, numbering the cells in 5 meristems, we have found 7 tetranucleate cells and 24 trinucleate ones and 15 cells of the same nature but with partial cytokinesis. It is to be noticed that DGR does not modify the duration of G_1 and M, but it considerably lengthens S and G_2; these delays cannot be linked with cytokinesis inhibition[2].

So it is clear that DGR has a specific action during G_2 inducing a cytokinesis inhibition. From now on it is possible to discriminate between 2 kinds of cytokinesis-inhibitors: those which extemporaneously alter the constituent of phragmoplast (such as MHQD) and those which disturb one or several processes foregoing mitosis. At present it is difficult to pinpoint the specially affected process (s).

Other puric or pyrimidic components having no similar effect, we can exclude any action upon nucleic acids. On the other hand, because of the part played by GTP in the synthesis of proteins and of some polyosides, we are entitled to assume that inhibition takes place on the Golgi apparatus.

1 A. Brulfert, E. Clain and G. Deysson, Experientia *30*, 1010 (1974).
2 M.-J. Lasselain, C. Pareyre and G. Deysson, in press.
3 G. Deysson, C. R. Soc. Biol. *163*, 37 (1969).
4 G. Deysson and L. Chaouat, C. R. Soc. Biol. *167*, 188 (1973).